

ROS in Autonomous Systems Applications (ROS / Ubuntu Installation - Process)

*This Document is prepared to help in the installation process of ROS
Neotic by installing Ubuntu 20.04 on a dual boot machine*

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How to install Ubuntu 20.04

- During the ROS in Autonomous Systems Applications, Ubuntu 20.04 LTS is used for the development environment.
- The below links shows the steps for the dual boot installation process in general
<https://www.wikihow.com/Dual-Boot-Windows-10-and-Ubuntu-16.04>
<https://www.youtube.com/watch?v=qNeJvujdB-0>
<https://www.youtube.com/watch?v=4jGQl6SeS2o>
<https://www.youtube.com/watch?v=u5QyjHIYwTQ>
- The installation process is as follows:
 1. **Download Desktop image of Ubuntu 20.04:** install the Desktop version
<https://releases.ubuntu.com/focal/>
 2. **Make USB for booting:** Rufus3.8 is one of the programs used for creating bootable USB. Please make sure to choose the suitable partition scheme (MBR or GBT)
<https://rufus.ie/>
 3. **Setting Unallocated space:** from disk management, reduce the size of partition. You will need at least **50GB** for installing Ubuntu and the other requirements.
 4. Set the BIOS options of your laptop to boot the USB first.

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Common Issues

Based on your laptop specs, there might be some common issues. Below you can find the solution for some of them.

1. Wifi Enabling Issue (For Lenovo Laptops ONLY):

https://forums.lenovo.com/t5/Gaming-Laptops-Knowledge-Base/Installing-Ubuntu-on-your-Lenovo-Legion/tac-p/4206608?fbclid=IwAR01trqgnFJsLrxSzx_BDEUCsEACmuwfx2YJRYR_BsNZUA4dL95ci5RivWUA#M62

In Ubuntu terminal, do the below steps:

- A. Run the command `sudo gedit /etc/modprobe.d/blacklist.conf`
- B. Add `blacklist ideapad_laptop` to the end of the file and save, this will get wifi working permanently.
- C. Run the command `reboot` for restarting the operating system.

2. Install Latest NVIDIA Drivers In Linux

<http://www.linuxandubuntu.com/home/how-to-install-latest-nvidia-drivers-in-linux>

You would know that you have this problem when you try to open ubuntu and the login screen is freezed and can not open the system.

- A. From the boot grub menu choose **advanced options for Ubuntu** then choose the **recovery mode** option.
- B. Select **Drop to root shell prompt** to boot into a root terminal.
- C. Write the below commands the press **Esc**
 - a. `mount -o remount,rw /`
 - b. `mount -a`
- D. Now, select **resume normal boot** and Ubuntu will work on recovery mode.
- E. Open the terminal and write the below commands the **reboot**
 - a. `sudo apt-get purge nvidia*`
 - b. `sudo add-apt-repository ppa:graphics-drivers`
 - c. `sudo apt-get update`
 - d. `sudo apt-get install nvidia-370` (Note: this command might give an error based on the Nvidia driver on your laptop. The error will tell you exactly what to write instead of **370**).

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How to install ROS

Most of this section referred to a tutorial in ROS wiki. If you don't understand this instruction or have any problem, see the tutorial.

<http://wiki.ros.org/noetic/Installation/Ubuntu>

1. Setup your sources.list: Setup your computer to accept software from packages.ros.org.

```
sudo sh -c 'echo "deb http://packages.ros.org/ros/ubuntu $(lsb_release -sc) main" > /etc/apt/sources.list.d/ros-latest.list'
```

2. Set up your keys:

```
curl -s https://raw.githubusercontent.com/ros/rosdistro/master/ros.asc | sudo apt-key add -
```

Note: if curl is not installed, run the below command before setting up the keys

```
sudo apt install curl
```

3. Installation:

Update the operating system: `sudo apt-get update`

- If you will see the following error in the terminal:

- Reading package lists... Done
- E: Could not get lock /var/lib/apt/lists/lock - open (11: Resource temporarily unavailable)
- E: Unable to lock directory /var/lib/apt/lists/

It can be solved by running following command:

```
sudo rm /var/lib/apt/lists/lock
```

Desktop-Full Install: `sudo apt install ros-noetic-desktop-full`

4. Environment setup:

```
source /opt/ros/noetic/setup.bash
echo "source /opt/ros/noetic/setup.bash" >> ~/.bashrc
source ~/.bashrc
```

5. Dependencies for building packages:

```
sudo apt install python3-rosdep python3-rosinstall python3-rosinstall-generator python3-wstool build-essential
```

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6. Initialize rosdep:

```
sudo apt install python3-rosdep  
sudo rosdep init  
rosdep update
```

7. Create a ROS Workspace:

```
mkdir -p ~/catkin_ws/src  
cd ~/catkin_ws/  
catkin_make  
source devel/setup.bash
```

8. Now, ROS is ready to be used ...

9. In order to build the ROS workspace every time you make a change or add a package, you have to run the 3 following commands to avoid any errors in building the workspace.

```
source /opt/ros/neotic/setup.bash  
catkin_make  
source devel/setup.bash
```

10. In order to avoid calling the 3 commands continuously, you can add command (a and c)

```
cd ~  
gedit .bashrc
```

Add the below lines at the end of the file and save.

```
source /opt/ros/neotic/setup.bash  
source ~/catkin_ws/devel/setup.bash
```

Now, you can only build the workspace using `catkin_make`

11. Now, you can start the beginning ROS tutorials
<http://wiki.ros.org/ROS/Tutorials>

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Important Programs to be installed on Ubuntu

1. Qtcreator

- a. `sudo apt-get install build-essential`
- b. `sudo apt-get install qtcreator`
- c. `sudo apt-get install qt5-default`

2. IDLE

- d. `sudo apt-get install idle3`

3. Notepad++

- e. `sudo apt-get install snapd snapd-xdg-open`
- f. `sudo snap install notepad-plus-plus`

4. Eclipse

- g. `sudo apt-get install eclipse eclipse-cdt g++`

5. Shutter: for screenshot and editing images

- h. `sudo apt-get install shutter`

6. OBS Studio: for desktop recording (save videos as .mp4 extension)

- i. `sudo add-apt-repository ppa:obsproject/obs-studio`
- j. `sudo apt-get update`
- k. `sudo apt-get install obs-studio`

7. Terminator

- l. `sudo apt-get install terminator`

8. Adobe Reader

- m. `sudo add-apt-repository "deb http://archive.canonical.com/
precise partner"`
- n. `sudo apt-get update`
- o. `sudo apt install adobereader-enu`
- p. `sudo add-apt-repository -r "deb http://archive.canonical.com/
precise partner"`
- q. `sudo apt update`